

Assessing Data Management Practices and How it Affects the Interoperability of Collections and Research Data

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SMITHSONIAN NATIONAL MUSEUM OF NATURAL HISTORY

Our Collections



DIGITIZATION HISTORY

- 1970s – 2001: SELGEM
- 2001 – 2015: EMu
- 2015 - Present: Enhancing EMu



- 700,000 digital catalog records
- Fully digitized collection = 8,000,000 records

The Bigger Picture

DIGIVOL

 **iDigBio**
Integrated Digitized Biocollections

Biodiversity
Information
Standards
T D W G



 **DigPaleo**

eOL
Encyclopedia of Life



 **GBIF**
Global Biodiversity
Information Facility



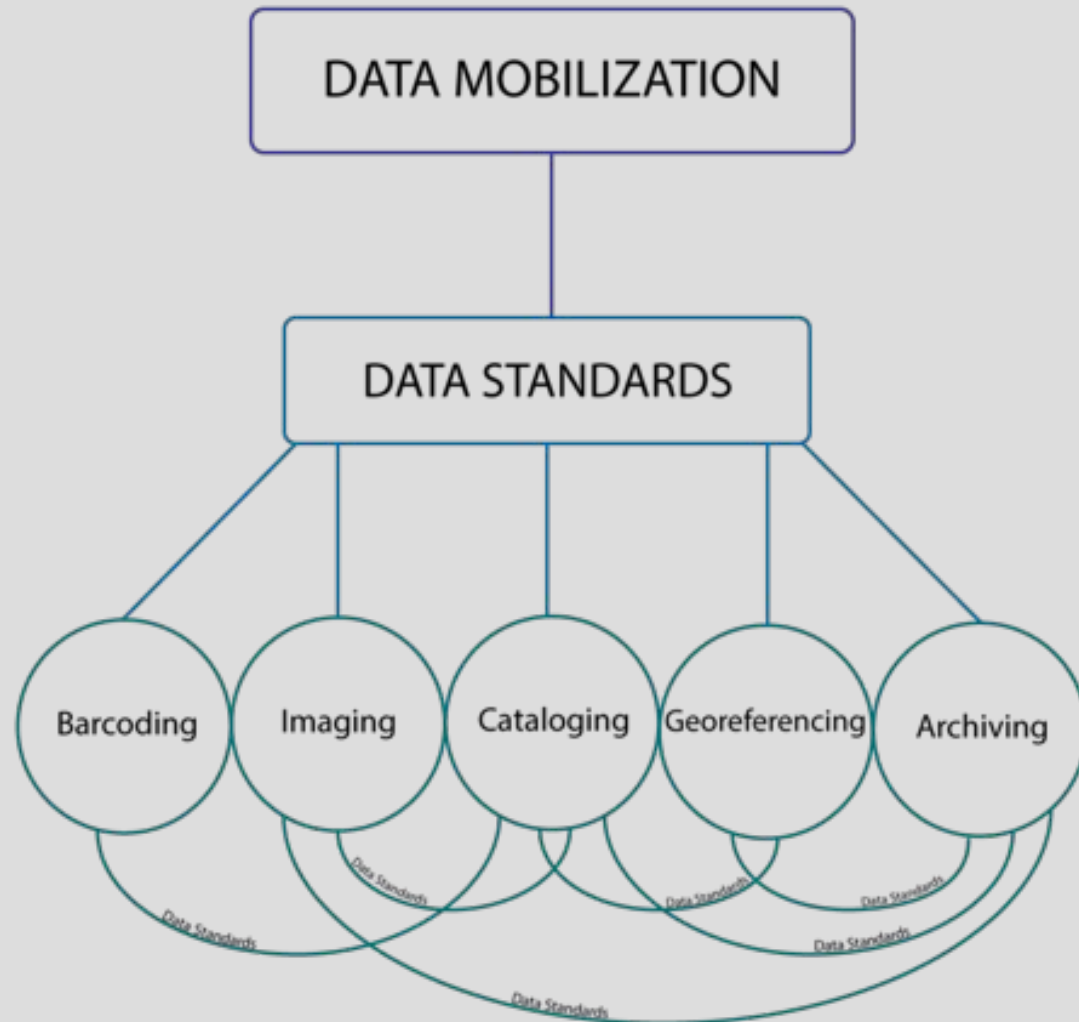
Smithsonian
National Museum of Natural History

GEOLocate 



**BIODIVERSITY
COLLECTIONS NETWORK**

Importance of Data Standards



Standards support and pull together all collections efforts and promote:

- ❖ Discoverability
- ❖ Interoperability
- ❖ Efficiency
- ❖ Integrity
- ❖ Quality
- ❖ Comprehensiveness
- ❖ Preservation

Database (Internal) Philosophy 101

- What is the purpose of the database?
- What data are important to record in the database and what data can be left with the specimen?
- How much should be considered an authority?
- What standards have already been established and what new standards are needed?

Casts: Data Evaluation - Objects



Fossil

1 USNM
1 catalog record



Fossil AND Cast

1 USNM
1 catalog record



Cast

1 USNM
1 catalog record



1 USNM
2 catalog records

2 USNMs
2 catalog records

Casts: Data Evaluation – in EMu

**As a
Suffix**

Cataloging Details		
Prefix:	Catalog number:	Suffix:
PAL	299545	Cast

As a Preparation

**Data Not
Recorded**

In Notes

Note Details	
Note:	Cast of USNM 8825.

Note Details	
Note:	With plaster cast.

Note Details	
Note:	Cast

Note Details	
Note:	Includes cast.

Note Details	
Note:	Cast of type.

Note Details	
Note:	Orig number 330f, mineralogical and geological mus, univ of copenhagen, plastic cast, amour fairly complete. , 2 casts.

Preparation Details		
	Preparation	P
1	Cast	
*		

Preparation Details		
	Preparation	P
1	cast	
*		

Preparation Details		
	Preparation	P
1	Cast/mold	
*		

Casts: Revised Structure and Data Standards

1 USNM
1 catalog record



Preparation Details						
	Preparation	Prepar...	Date	Count	Size	Remarks
1	Cast			1		Cast of MCZ 4200
*						

Preparation Details						
	Preparation	Prepar...	Date	Count	Size	Remarks
1	Fossil			1		
2	Cast			1		
*						



Preparation Details						
	Preparation	Prepar...	Date	Count	Size	Remarks
1	Fossil			12		
2	Cast			3		Skull (2), femur (1)
*						

Casts: Sharing Data

DwC Field = Preparation

Preparation Details						
	Preparation	Prepar...	Date	Count	Size	Remarks
1	Fossil			1		
2	Cast			1		
*						

Specimen	
Type Status	holotyp
Catalog Number	PAL491
Preparations	Fossil; Cast
Individual Count	1
Institution Code	USNM

Specimen	
Catalog Number	PAL406292
Preparations	Lot
Individual Count	1
Institution Code	USNM

iDigBio Portal
Record Detail

Morphology: Data Evaluation

Morphology Codes

Skull elements, lower jaw, Axial element, thoracic vertebra, Appendicular elements, pelvic girdle, phalange

Morphology Codes

Axial elements - partial, Appendicular elements - partial

Morphology Codes

Skull and skeleton

Morphology Codes

hyobranchial elements ectocuneiform

Morphology Codes

Appendicular element, left tibia

Morphology Codes

Skull element, partial left mandible, tooth P3-M3-AA

Morphology Codes

Appendicular elements



- Text string
- Not search friendly
- Not standardized
- Format (General)
 - Skull element
 - Appendicular element
 - Axial element

Morphology: Revised Structure and Data Standards

General	Element	Remarks
Skull	Cranium, Teeth	Partial
Skull	Isolated Teeth	Left p3-m2
Vertebra	Dorsal	
Girdle	Scapula	Left and right
Limb	Femur	Distal
Limb	Unidentified Digit	
Other	Coprolite	

- Standardized terms
- Increases searchability
- Created guidelines
- Flexible

Morphology: Ongoing Process



Previously in EMu:

Skull. Axial Elements. Appendicular Element, left femur

Future Table:

General	Element	Remarks
Skull	Cranium, Teeth	
Rib Cage	Rib	
Limb	Femur	Left distal

What is Recorded Now:

Skull. Cranium, Teeth; Rib Cage. Rib; Limb. Femur. Distal

Morphology: Sharing Data

NMNH Paleo Collections
Public Database Search
USNM V 4735, *Ceratosaurus*

Ceratosaurus nasicornis Marsh, 1884 : Ceratosauridae : Saurischia : Reptilia : Chordata

Catalog Number: USNM V 4735
Collection Name: Reptilia Primary Type; Deep Time Exhibit
Kingdom: Animalia
Phylum: Chordata
Class: Reptilia
Order: Saurischia
Family: Ceratosauridae
Common Name: Dinosaur
Scientific Name (As Filed): **Ceratosaurus nasicornis** Marsh, 1884
Type Status: Holotype
Type Citations: Marsh, 1884, Am.Jour.Sci. 27: 330, pl.8,f.9-10.
Carrano, M. T. & Choiniere, J. 2016 New information on the forearm and manus of *Ceratosaurus nasicornis* Marsh, 1884 (Dinosauria, Theropoda), with implications for theropod forelimb evolution. Jour. Vertebrate Paleo. 10.1080/02724634.2015.1054497
Gilmore, 1920. U.S.Natl.Mus.Bull. 110

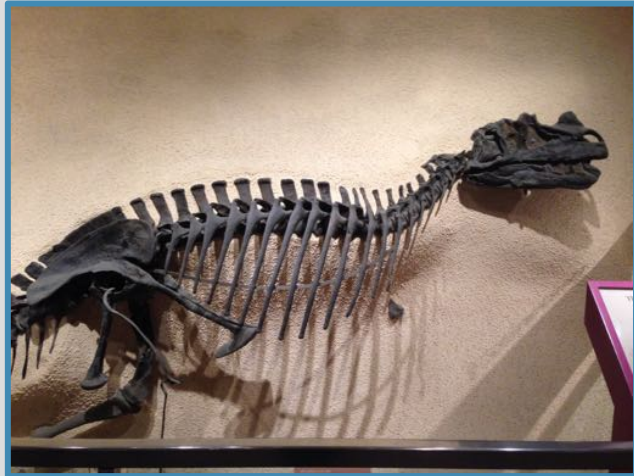
Collector(s): Felch, Marshall Parker
Dates Collected: 1883
Country: United States
Province/State: Colorado
District/County: Fremont County
Geologic Age: Era System Series Stage
Mesozoic Jurassic Upper/Late Kimmeridgian
Stratigraphy: Group Formation Member

Skeletal Morphology: Skull. Cranium, Teeth; Skull. Mandible, Teeth. Left and right; Vertebra. Atlas; Vertebra. Axis; Vertebra. Cervical. 3-7, 8 and 9 partial; Vertebra. Dorsal. 2-7, 10-14, partial 2, 4, 7, 10; Vertebra. Caudal. 1-26, 28-51; Vertebra. Chevron. 3-7, 15, 26, 29-35, 37-40, partial 26, 32, 24, 38; Rib Cage. Rib. (13) right dorsal ribs; Girdle. Pelvic Girdle; Girdle. Scapulocoracoid. Right; Limb. Radius. Left; Limb. Ulna. Left; Limb. Metacarpal. Left I-IV, right I, II, IV; Limb. Phalanges. Left II, III, right III; Limb. Femur. Left and right; Limb. Tibia. Left and right; Limb. Fibula. Right; Limb. Astragalus. Left and right; Limb. Calcaneum. Left and right; Limb. Metatarsal. Left; Limb. Phalanges. Left terminal IV; Other. Osteoderm. Cervical and caudal

Specimen Count: 1

Skeletal Morphology: Skull. Cranium, Teeth; Skull. Mandible, Teeth. Left and right; Vertebra. Atlas; Vertebra. Axis; Vertebra. Cervical. 3-7, 8 and 9 partial; Vertebra. Dorsal. 2-7, 10-14, partial 2, 4, 7, 10; Vertebra. Caudal. 1-26, 28-51; Vertebra. Chevron. 3-7, 15, 26, 29-35, 37-40, partial 26, 32, 24, 38; Rib Cage. Rib. (13) right dorsal ribs; Girdle. Pelvic Girdle; Girdle. Scapulocoracoid. Right; Limb. Radius. Left; Limb. Ulna. Left; Limb. Metacarpal. Left I-IV, right I, II, IV; Limb. Phalanges. Left II, III, right III; Limb. Femur. Left and right; Limb. Tibia. Left and right; Limb. Fibula. Right; Limb. Astragalus. Left and right; Limb. Calcaneum. Left and right; Limb. Metatarsal. Left; Limb. Phalanges. Left terminal IV; Other. Osteoderm. Cervical and caudal

Specimen Count: 1



Darwin Core doesn't currently support morphology

Morphology: Sharing Data

- Access to Biological Collections Data Extended For Geosciences (ABCD EFG) – Palaeontological Unit
 - Articulation
 - Completeness
 - PartOfOrganism
- TDWG Paleo Interest Group
 - <https://github.com/tdwg/paleo>
- Develop Best Practices and Guidelines
- Vert Paleo, Invert Paleo, Paleobotany

Continuing Work – Paleo Community

- TDWG Paleo Interest Group
 - <https://github.com/tdwg/paleo>
- Darwin Core Questions and Answers Site/iDigBio Darwin Core Webinar Series
 - <https://github.com/tdwg/dwc-qa>
- iDigBio Paleo Digitization Working Group Webinar Series
 - https://www.idigbio.org/wiki/index.php/Paleo_Digitization_Working_Group

Continuing Work – NMNH Paleo

- Continuing to evaluate EMu and data
- Presentation at Society for the Preservation of Natural History Collections (SPNHC), June 18-24, Denver, CO
 - Analysis of Fossil Data Standards at the Smithsonian NMNH Department of Paleobiology
- Poster at Society of Vertebrate Paleontology (SVP), August 23-26, Calgary, Canada
 - Developing Guidelines to Increase Data Accessibility and Interoperability for Vertebrate Fossils

Thank you!

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